

CLAIMS

1. A liquid discharge apparatus comprising:
a head in which a plurality of nozzle-incorporated liquid discharge sections are arrayed;
discharge direction deflection means for deflecting the discharge direction of a liquid discharged from a nozzle of each of said liquid discharge sections in the direction of the array of said liquid discharge sections;

distance detection means for detecting the distance between the liquid discharge surface of said head and the liquid landing surface of a liquid discharge target; and

discharge deflection amount determination means for determining the amount of liquid discharge deflection to be provided by said discharge direction deflection means in accordance with the result of detection by said distance detection means.

2. The liquid discharge apparatus according to claim 1, wherein said distance detection means detects the distance between the liquid discharge surface of said head and the liquid landing surface of the liquid discharge target by detecting the thickness of the liquid discharge target.

3. The liquid discharge apparatus according to claim 1, wherein said distance detection means comprises a sensor for reading the information about light, pressure, displacement, or other physical quantity; and wherein said sensor detects the distance between the liquid discharge surface of said head and the liquid landing surface of the liquid discharge target.

4. The liquid discharge apparatus according to claim 1, wherein said distance detection means receives information for determining the properties of the liquid discharge target and detects the distance between the ink discharge surface of said head and the ink landing surface of the liquid discharge target in accordance with the received information.

5. The liquid discharge apparatus according to claim 1, wherein said distance detection means receives information that is input from said liquid discharge apparatus or a device electrically connected to said liquid discharge apparatus and used to determine the properties of the liquid discharge target, and detects the distance between the ink discharge surface of said head and the ink landing surface of the liquid discharge target in accordance with the received information.

6. The liquid discharge apparatus according to

claim 1, wherein each of said liquid discharge sections comprises a liquid chamber for containing the liquid to be discharged and energy generation means that is positioned within said liquid chamber to generate energy for discharging the liquid in said liquid chamber from said nozzle; wherein a plurality of said energy generation means are arrayed within said liquid chamber in the direction of liquid discharge section arrangement; and wherein said discharge direction deflection means causes an energy generation difference between at least one of said plurality of energy generation means in said liquid chamber and at least another of said plurality of energy generation means, and deflects the direction of a liquid discharge from said nozzle of each of said liquid discharge sections.

7. The liquid discharge apparatus according to claim 1, wherein each of said liquid discharge sections comprises a liquid chamber for containing the liquid to be discharged and energy generation means that is positioned within said liquid chamber to generate energy for discharging the liquid in said liquid chamber from said nozzle; wherein said energy generation means is made of a base substance so that a major section for generating energy for discharging the liquid is divided

into a plurality of segments; and wherein said discharge direction deflection means causes an energy generation difference between at least one of said plurality of main segments of said energy generation means and at least another of said plurality of main segments of said energy generation means, and deflects the direction of a liquid discharge from said nozzle of each of said liquid discharge sections.

8. A liquid discharge method for discharging a liquid with a head in which a plurality of nozzle-incorporated liquid discharge sections are arrayed, the liquid discharge method comprising the steps of:

detecting the distance between the liquid discharge surface of said head and the liquid landing surface of a liquid discharge target when the direction of the liquid discharge from a nozzle of each of said liquid discharge sections is to be deflected in the direction of liquid discharge section arrangement; and

determining the amount of liquid discharge deflection in accordance with the result of detection.

9. A liquid discharge apparatus comprising:
a head in which a plurality of nozzle-incorporated liquid discharge sections are arrayed;
discharge direction deflection means for

deflecting the discharge direction of a liquid discharged from a nozzle of each of said liquid discharge sections in a plurality of directions of the array of said liquid discharge sections;

relative movement means for relatively moving said head and a liquid discharge target on which the liquid discharged from said nozzle of each of said liquid discharge sections is to land;

distance detection means, which exists on the side on which said relative movement means loads the liquid discharge target relative to said head, emits a material wave to the liquid discharge target, receives the resulting reflected wave, detects the distance between the liquid discharge surface of each of said liquid discharge sections and the liquid landing surface of the liquid discharge target in accordance with the received reflected wave, and sequentially detects said distance while said relative movement means relatively moves said head and the liquid discharge target;

a data table for defining the discharge deflection amount of the liquid to be discharged from said nozzle of each of said liquid discharge sections in relation to said distance and a landing target position of the liquid to be discharged from said nozzle of each

of said liquid discharge sections; and

discharge deflection amount determination means for referencing said data table and determining the amount of liquid discharge deflection to be provided by said discharge direction deflection means corresponding to each of said liquid discharge sections from said distance detected by said distance detection means and the landing target position of the liquid.

10. The liquid discharge apparatus according to claim 9, wherein said distance detection means emits pulsed light to the liquid discharge target, receives the resulting reflected light, and detects said distance in accordance with the wavelength of the received reflected light.

11. The liquid discharge apparatus according to claim 9, wherein said distance detection means detects said distance by emitting an ultrasonic wave to the liquid discharge target and measuring the time interval between the instant at which the ultrasonic wave is emitted and the instant at which the resulting reflected wave is received.

12. The liquid discharge apparatus according to claim 9, wherein said distance detection means comprises a plurality of distance detection means including first

distance detection means and second distance detection means, which are arrayed in the direction of liquid discharge section arrangement, further comprising distance setup means, which, if a distance nondetection area exists between said first distance detection means and said second distance detection means, which are arrayed in the direction of liquid discharge section arrangement, an existing liquid discharge section corresponds to the distance nondetection area, and said distance detected by said first distance detection means differs from said distance detected by said second distance detection means, said distance setup means sets said distance concerning said liquid discharge section corresponding to said distance nondetection area to a value between said distance detected by said first distance detection means and said distance detected by said second distance detection means.

13. The liquid discharge apparatus according to claim 9, wherein said distance detection means detects a reference distance between the liquid discharge surface of each of said liquid discharge sections and a liquid landing reference surface at a plurality of locations in the direction of liquid discharge section arrangement, further comprising:

correction value calculation means, which, when said reference distance detected by said distance detection means at a plurality of locations in the direction of liquid discharge section arrangement varies, calculates a correction value for determining the liquid discharge deflection amount to be provided by said discharge direction deflection means corresponding to each of said liquid discharge sections in accordance with said reference distance detected by said distance detection means at a plurality of locations; and

correction value storage means for storing the results of calculations performed by said correction value calculation means,

wherein said discharge deflection amount determination means references said data table and determines the amount of liquid discharge deflection to be provided by said discharge direction deflection means corresponding to each of said liquid discharge sections from said distance detected by said distance detection means, the liquid landing target position, and the correction value stored by said correction value storage means.

14. The liquid discharge apparatus according to claim 9, wherein the side to which the liquid discharge

target is loaded for said head by said relative movement means is provided with a retention member, which provides a constant distance between the discharge surface of said head and the liquid landing surface of the liquid discharge target when the liquid landing surface of the liquid discharge target is contacted; and wherein said distance detection means is installed so that the emitted material wave and the reflected wave derived from the emitted material wave pass between said head and said retention member in the relative movement direction of said head and the liquid discharge target.

15. A liquid discharge apparatus comprising:

a head in which a plurality of nozzle-incorporated liquid discharge sections are arrayed;

discharge direction deflection means for deflecting the discharge direction of a liquid discharged from a nozzle of each of said liquid discharge sections in a plurality of directions of the array of said liquid discharge sections;

relative movement means for relatively moving said head and a liquid discharge target on which the liquid discharged from said nozzle of each of said liquid discharge sections is to land;

distance information acquisition means for

acquiring distance information about the distance between the liquid discharge surface of each of said liquid discharge sections and the liquid landing surface of the liquid discharge target while said relative movement means relatively moves said head and the liquid discharge target;

a data table for defining the discharge deflection amount of the liquid to be discharged from said nozzle of each of said liquid discharge sections in relation to the distance between the liquid discharge surface of each of said liquid discharge sections and the liquid landing surface of the liquid discharge target and a landing target position of the liquid to be discharged from said nozzle of each of said liquid discharge sections; and

discharge deflection amount determination means for referencing said data table and determining the amount of liquid discharge deflection to be provided by said discharge direction deflection means corresponding to each of said liquid discharge sections from said distance information acquired by said distance information acquisition means and the landing target position of the liquid.

16. A liquid discharge method for discharging a

liquid with a head in which a plurality of nozzle-incorporated liquid discharge sections are arrayed to deflect the discharge direction of a liquid discharged from a nozzle of each of said liquid discharge sections in the direction of liquid discharge section arrangement, the liquid discharge method comprising the steps of:

predefining the discharge deflection amount of the liquid discharged from said nozzle of each of said liquid discharge sections in relation to the distance between the liquid discharge surface of each of said liquid discharge sections and the liquid landing surface of a liquid discharge target and a landing target position of the liquid discharged from said nozzle of each of said liquid discharge sections; and

emitting a material wave to the liquid discharge target when the discharge direction of the liquid discharged from said nozzle of each of said liquid discharge sections is to be deflected in the direction of liquid discharge section arrangement, receiving the resulting reflected wave, detecting the distance between the liquid discharge surface of each of said liquid discharge sections and the liquid landing surface of the liquid discharge target in accordance with the received reflected wave, and determining the discharge deflection

amount of a liquid corresponding to each of said liquid discharge sections from said detected distance, the liquid landing target position, and the predefined discharge deflection amount.

17. A liquid discharge method for discharging a liquid with a head in which a plurality of nozzle-incorporated liquid discharge sections are arrayed to deflect the discharge direction of a liquid discharged from a nozzle of each of said liquid discharge sections in the direction of liquid discharge section arrangement, the liquid discharge method comprising the steps of:

predefining the discharge deflection amount of the liquid discharged from said nozzle of each of said liquid discharge sections in relation to the distance between the liquid discharge surface of each of said liquid discharge sections and the liquid landing surface of a liquid discharge target and a landing target position of the liquid discharged from said nozzle of each of said liquid discharge sections;

acquiring distance information about the distance between the liquid discharge surface of each of said liquid discharge sections and the liquid landing surface of the liquid discharge target in accordance with relative movement of said head and the liquid discharge

target; and

determining the discharge deflection amount of a liquid corresponding to each of said liquid discharge sections from said acquired distance information, the liquid landing target position, and the predefined discharge deflection amount.